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Dated: November 17, 2010
Electronic Signature for Kevin J. Canning: /Kevin J. Canning/

Docket No.: TOW-051RCE3
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Seiji Sugiura *et al.*

Application No.: 10/721,616 | Confirmation No.: 5616

Filed: November 24, 2003 | Art Unit: 1795

For: FUEL CELL | Examiner: B. Lewis

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This brief is filed within five months from the receipt of the Notice of Appeal dated June 17, 2010 along with a Request for Extension of Time for three months. The fees required under 37 C.F.R. § 41.20(b)(2) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. §41.37 and M.P.E.P. §1205.2:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Honda Motor Co., Ltd.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in the Application

There are 4 claims pending in the application.

B. Current Status of Claims

1. Claims canceled: 3, 4
2. Claims withdrawn from consideration but not canceled: No
3. Claims pending: 1, 2, 5, 6
4. Claims allowed: None
5. Claims rejected: 1, 2, 5, 6

C. Claims on Appeal

The claims on appeal are claims 1, 2, 5, 6.

IV. STATUS OF AMENDMENTS

Appellant did not file an Amendment After Final Rejection. Appellant submits for the record that they filed with the USPTO a Pre-Appeal Brief Request For Review and Notice of Appeal on June 17, 2010. A Notice of Panel Decision was issued by the USPTO on June 24, 2010 indicating that the application remains under appeal.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present application is generally directed to a fuel cell system with an air vent. In traditional fuel cell stacks, electrolyte electrode assemblies for generating electricity are sandwiched by separator plates. The separator plates include flow fields for supplying reactant gases (e.g., an oxygen-containing gas and a fuel gas, such as hydrogen) to the electrolyte electrode assemblies. The different reactant gases are delivered to opposing sides of the electrode assemblies and undergo a reaction to produce electricity (*Specification at page 1, lines 5-22*).

One byproduct of the reaction is heat. Accordingly, many conventional fuel cells include a coolant flow passage, for example between adjacent separator plates (see, e.g., Figure 2 of the present Application). Coolant is supplied across the surface of the separators to cool the fuel cell, and particularly to cool the region adjacent to the electrode assemblies, where the power and therefore most of the heat is generated. Coolant enters the flow field from a coolant inlet, typically flows through a serpentine coolant flow field, and leaves the coolant flow field through a coolant outlet (*Specification at page 3, lines 6-13*).

Problematically, air can pass into the coolant flow field along with the coolant fluid (*Specification at page 3, line 25, through page 4, line 5*). The air collects at the top of the coolant flow field, since the air is buoyant in the coolant (*please see Figure 13 of the present Application, labeled "Prior Art"*), and further collects towards the end of the coolant flow path near the coolant outlet, since the air in the coolant flow field is pushed along by the flow of the coolant (*Specification at page 19, line 17 through page 20, line 23*). Because portions of the coolant flow field are taken up by air instead of coolant (i.e., the air displaces the coolant), corresponding portions of the electrolyte assemblies are not cooled efficiently (*Specification at page 4, lines 5-8*).

The present application solves this problem by providing an air-releasing passage for the coolant flow field at <u>particular locations</u> on the separator and in a <u>particular configuration</u> with other passages in the separator (please see, e.g., Figure 6 of the present application).

More specifically, the inventive air releasing passage (25) is formed at an upper position of the end of the separator (16) opposite the coolant inlet (22a), and is provided above (and is aligned with) the coolant discharge passage (22b). The coolant supply passage and the coolant

discharge passage are provided at opposite ends of the separator (i.e., one on the left, and one on the right in Figure 6) so that coolant flows from the inlet to the outlet across the separator, and each is provided at a middle portion of the separator (e.g., halfway down the separator in Figure 6).

Since the air in the coolant flow field is more buoyant than the coolant, the air naturally moves upwardly towards the air-releasing passage (located at the top of the coolant flow field). At the same time, the coolant is flowing toward the coolant discharge passage (e.g., left-to-right in Figure 6), and so the air is encouraged to flow <u>with the coolant</u> toward the air-releasing passage (*Specification at pages 19-20*).

For example, claim 1 recites:

> 1. A fuel cell (*Specification at page 7, line 15, element 10*) comprising: an electrolyte electrode assembly (*Figure 1, element 12*) including a pair of electrodes (*Figure 2, elements 28 and 30*) and an electrolyte interposed between said electrodes (*Figure 2, element 26*);
>
> separators (*Figures 1 and 2, element 13 comprising metal plates 14 and 16*) for sandwiching said electrolyte electrode assembly (*Figure 2, the left separator 13 and the right separator 13 sandwich the electrolyte electrode assembly 12*), wherein the separator is in an upright position (*Figure 1*) and a width of the separator is greater than a height of the separator (*Figures 3-7 and 11*), wherein a reactant gas supply passage (*Figure 1, the reactant gases being the oxygen-containing gas and the fuel gas, and the reactant gas supply passages being elements 20a for the oxygen and 24a for the fuel gas*), a reactant gas discharge passage (*Figure 1, element 20b for the oxygen and 24b for the fuel gas*), a coolant supply passage (*Figures 1 and 6, element 22a*), and a coolant discharge passage (*Figures 1 and 6, element 22b*) extend through said fuel cell in a stacking direction of said fuel cell (*Figure 1, the stacking direction is designated by the axis marked "A"*);
>
> a coolant flow field (*Figures 2 and 6, element 42*) is formed along a surface (*Figure 6, element 16a*) of said separator and extends along a portion of

said surface that corresponds to a power generation surface (*Specification at page 19, lines 3-6*) of said electrolyte electrode assembly (*element 12*), wherein said coolant flow field connects said coolant supply passage to said coolant discharge passage (*Figure 6*);

said coolant supply passage (*Figure 6, element 22a*) is provided at a middle position of one vertical end of said separator (*Figure 6, the separator includes horizontally-extending ends, which are located at the top and bottom, and vertically-extending ends which are located on the left and right; the coolant supply passage 22a is located at a middle position, horizontally, on the left vertical end of the separator*), and said coolant discharge passage is provided at a middle position of the other vertical end of said separator (*Figure 6, element 22b is located in the middle on the opposed vertical end of the separator*); and

an air-releasing passage (*Figure 6, element 25*) connected to said coolant flow field (*Figure 6, element 25 is connected to the coolant flow field 42*) for releasing air from said coolant flow field (*Specification at page 5, lines 5-6*) is formed at an upper position of the other vertical end of said separator (*Figure 6; Specification at page 5, lines 5-10*) such that at least part of said air-releasing passage is positioned above a top of said coolant flow field (*Figures 6 and 8-10; Specification at page 5, lines 8-10*),

wherein said coolant flow field is in fluid communication with said coolant supply passage, said coolant discharge passage and said air-releasing passage (*Figure 6*) on a single surface of said separator (*Figure 6, surface 16a*), wherein said separator includes first and second metal plates (*Figure 2, separator 13 includes metal plates 14 and 16*) which are stacked together (*Figure 2*), and said coolant flow field is formed between said first and second metal plates (*Figure 2*), wherein said coolant flow field is in contact with said first and second metal plates (*Figure 2*), wherein said air-releasing passage is positioned above said coolant discharge passage at the other vertical end of the separator (*Figure 6*), wherein the air-releasing passage is aligned with the coolant discharge passage on the same side of the separator as the coolant discharge passage is positioned

(*Figure 6, air releasing passage 25 is aligned with coolant discharge passage 22b on the same side of the separator as coolant discharge passage 22b*).

At least claim 2 recites further patentable subject matter.

For example, claim 2 recites:

> 2. A fuel cell according to claim 1, wherein at least the top of said coolant flow field is inclined upwardly toward said air-releasing passage (*Figure 11, note the angle θ indicating the incline between the horizontal and the top of the coolant flow field 110*).

Locating the air-releasing passage in the particular location recited in the present claims (e.g., the top corner above the coolant discharge passage), <u>and also</u> locating the other passages in particular locations on the separator results in a single configuration that achieves at least two <u>functions</u>. First, the air in the coolant naturally travels upward, because it is buoyant. Accordingly, by forming the air-releasing passage *at an upper position of the other vertical end of said separator* <u>*such that at least part of said air-releasing passage is positioned above a top of said coolant flow field*</u> (as recited in claim 1), the air-releasing passage cooperates with the coolant flow field to remove air as it naturally moves upward.

Second, the air in the coolant is carried along by the flow of the coolant. Thus, the flow of the coolant encourages the air to move towards the coolant discharge passage. Accordingly, by <u>aligning</u> the air-releasing passage *with the coolant discharge passage* <u>*on the same side of the separator as the coolant discharge passage is positioned*</u>, the air-releasing passage cooperates with the flow of the coolant as determined by the relative positions of the coolant supply passage and coolant discharge passage. Thus, <u>more air can be removed</u> from the coolant flow field than could otherwise be achieved if the air-releasing passage were located at the top of the separator, but in a different location along the horizontal axis of the separator. For example, if the air-releasing passage were aligned with the coolant <u>supply</u> passage instead of the <u>discharge</u> passage, then some air will pass by the air releasing passage as it is carried along by the coolant (for example, if the air has not yet had enough time to rise to the top of the separator due to buoyancy at the time that the air is carried by the coolant past the air-releasing passage). Thus, the air

would accumulate at the opposite side from the air-releasing passage, reducing the effectiveness of the air-releasing passage and causing less air to be removed from the coolant flow field.

Thus, because the air-releasing passage is located near the end of the path that the coolant takes to get from the coolant supply passage to the coolant discharge passage, the coolant naturally carries the air to the end of coolant passage, accumulating more air as it goes (due to both the upward movement of the air and the movement of the coolant). Accordingly, the air contained within the coolant flow field is reliably discharged from the coolant flow field through the air-releasing passage, thereby preventing the air from being trapped in the coolant flow field. Thus, the coolant is supplied to substantially the entire surface of the coolant flow field and the cooling efficiency of the fuel cell is improved dramatically (*Specification at page 22, line 27 through page 23, line 11*).

Furthermore, by inclining the top of the coolant flow field towards the air-releasing passage (claim 2), the air trapped at the top of the coolant flow field is further encouraged towards the air-releasing passage.

To achieve the above advantages, the claims of the present application recite a particular configuration for not only the air-releasing passage, but also the coolant supply and coolant discharge passages, and (in some claims) the reactant gas supply and discharge passages. It is because these parts interoperate and cooperate in a particular way that the above advantages can be achieved. Thus, the presently claimed invention provides a solution to trapped air in the coolant flow field of a fuel cell, improving the cooling efficiency of the fuel cell.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 2, 5, and 6 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 6,403,247 to Guthrie (hereafter "Guthrie") in view of U.S. Patent Publication No. 2001/0033954 to Gyoten (hereafter "Gyoten"); *see* Office Action dated March 17, 2010 at page 2.

VII. ARGUMENT

As noted above, claims 1, 2, 5, and 6 stand rejected under 35 U.S.C. §103(a) as being obvious over Guthrie in view of Gyoten. The relevant portion of the text of 35 U.S.C. Section 103 is set forth below.

> 35 U.S.C. §103(a) recites:
>
> A patent may not be obtained though the invention is not identically disclosed or described as set forth in Section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

A. *Claims 1, 5, and 6*

Appellants argue claims 1, 5, and 6 as a group, with independent claim 1 being representative of this group.

Applicants respectfully submit that Guthrie and Gyoten, alone or in any reasonable combination, do not disclose or suggest at least *a coolant supply passage provided at a middle position of one vertical end of said separator, and a coolant discharge passage provided at a middle position of the other vertical end of said separator*, wherein *the air-releasing passage is aligned with the coolant discharge passage on the same side of the separator as the coolant discharge passage is positioned*, as recited in claim 1.

The Examiner does not allege that Gyoten teaches these features of claim 1; instead, Gyoten is relied upon only for metallic separator plates (Office Action at page 5). Indeed, while Gyoten discusses fuel cells, Gyoten does not have an air-releasing passage akin to the one recited in claim 1. Accordingly, Gyoten does not discuss where such an air-releasing passage might be located on the separator. In fact, Gyoten does not even discuss the use of coolant or a coolant flow path, to which the air-releasing passage could be connected. Thus, Gyoten is entirely silent with respect to the above-quoted features of claim 1.

Guthrie is generally directed to a manifold assembly for a fuel cell. In Guthrie, two fuel cell stacks are provided side-by-side, and Guthrie provides a common manifold for allowing either the fuel gas or the oxidant gas to be shared between the two fuel cell stacks (Guthrie at Abstract and Figures 4-11). In one embodiment depicted in Figure 11, Guthrie depicts a fuel cell having a coolant gas vent 742 provided alongside the fuel inlet manifold and fuel outlet manifold. The Examiner focuses on the embodiment of Guthrie depicted in Figure 11, which is the only embodiment to include a "vent" in the coolant flow field.

It should be noted that a number of the other embodiments of Guthrie include passages labeled "Air In" and "Air Out;" however, these passages refer to the oxidant gas passages of the fuel cell. A fuel cell will typically take in air (an "oxygen containing gas"), which is combined with hydrogen (for example) to generate a reaction which results in the production of electricity. Thus, the "Air In" and "Air Out" passages in Figures 4 and 5 of Guthrie supply oxidant gas to the electrode assembly; they are not equivalent to the "air-releasing passage" of the present claims, which is *connected to said coolant flow field for releasing air from said coolant flow field*. As Figure 11 is the only embodiment of Guthrie to include a coolant gas vent, Applicants focus on Figure 11 for purposes of this appeal.

The Examiner interprets Guthrie's coolant gas vent 742 of Figure 11 as the "air-releasing passage" of the present application. However, Guthrie's separator configuration is entirely different from the configuration recited in claim 1. For example,

1) Claim 1 recites *a coolant supply passage provided at <u>a middle position</u> of <u>one vertical end</u> of said separator*; Guthrie's coolant inlet manifold (supply passage) is at the <u>right side</u> of a <u>horizontal end</u> of the separator.

2) Claim 1 recites *a coolant discharge passage provided at <u>a middle position</u> of the <u>other vertical end</u> of said separator*; Guthrie's coolant outlet manifold (discharge passage) is provided at the <u>left side</u> of the <u>same horizontal end</u> of the separator as the inlet manifold.

3) Claim 1 recites that *the air-releasing passage is <u>aligned with the coolant discharge</u>* passage; Guthrie's gas vent (air-releasing passage) is provided at the <u>opposite corner</u> of the separator from the coolant outlet manifold.

4) Claim 1 recites that the air releasing passage is positioned *<u>on the same side of the separator as the coolant discharge passage</u>*; Guthrie's air releasing passage is positioned on the <u>opposite side</u> of the separator from the coolant discharge passage.

Thus, in comparison to the present application, Guthrie provides the coolant gas vent in exactly <u>the opposite</u> position from the coolant discharge passage: the present application aligns the air-releasing passage with the coolant discharge passage on the same side of the separator, while Guthrie provides the vent in the <u>opposite corner</u> from the coolant outlet manifold.

The Examiner does not argue that Guthrie discloses or suggests these features of claim 1; indeed the Examiner recognizes that Guthrie fails to disclose or suggest these features (Office Action at pages 4-5). Rather, the Examiner asserts that these features "solve no stated problem and would be an obvious matter of design choice." Applicants respectfully disagree.

1. The Claimed Configuration Solves a Stated Problem

Applicants respectfully disagree that the recited features solve no technical problem. Claim 1 recites a specific structure (i.e. a particular configuration of the supply passage, discharge passage, air-releasing passage, and coolant flow field). This recited structure is directly responsible for the function of the fuel cell stack which solves the stated problem.

For example, because the air releasing passage is aligned with the coolant discharge passage on the same side of the separator in the claimed invention, the air in the coolant is carried across the separator by the coolant as the coolant moves towards the coolant discharge passage. This allows most of the air to be reliably discharged from the coolant flow field, because the air is both encouraged upwards (due to the air being lighter than the coolant) and towards the appropriate end of the separator (due to the motion of the coolant). This problem and solution are described in the Specification at pages 5-6.

Thus, the claimed configuration solves two stated problems: the air is naturally encouraged (by buoyancy) towards, and becomes trapped at, the top of the separator; and the air is encouraged (by the flow of the coolant) towards the coolant discharge passage, and becomes trapped near the end of the coolant flow field.

Even though Guthrie's vent is placed on top of the separator, Guthrie's vent is in the wrong horizontal alignment and the coolant inlet and outlet manifolds are also provided in the wrong location. Hence, Guthrie does not allow air encouraged by the flow of the coolant towards the end of the coolant flow field to escape. Indeed, the Guthrie reference specifically arranges the various parts of fuel cell in way that makes the problem worse.

As can be seen in Figure 11 of Guthrie, because the gas vent is not aligned with the outlet manifold, the flow of the coolant does not encourage the air trapped on the upper left side of Guthrie's coolant flow field towards the vent. Figure 11 depicts the path taken by the coolant, the oxidant, and the fuel gas using arrows in the dual-fuel-cell system of Guthrie (two distinct

separator structures are depicted, one on the left and one on the right). The oxidant passes from the oxidant inlet manifold 710 to the oxidant outlet manifold 712 (the right-to-left arrows in Figure 11). The fuel gas passes from the fuel inlet manifold 730 to the fuel outlet manifold 732, being directed from the top of the separator towards the bottom and then back to the top.

The coolant in Figure 11 enters the coolant flow field from the coolant inlet manifold 740. Guthrie specifically illustrates the coolant using two arrows to indicate that the coolant can follow one of two paths. The first path, indicated by the outer arrows in Figure 11, shows the coolant passing along the outside vertically-extending edge of the coolant flow field, then turning at the outer corner of the coolant flow field (past the coolant gas vent 742), then continuing along the outer edge of the flow field, turning at the inner corner of the coolant flow field, and returning to the coolant outlet manifold. The second path begins closer to the inner side of the coolant flow field and does not pass by the coolant gas vent 742. Instead, the second path curves back towards the coolant outlet manifold 744 approximately halfway across the separator plate.

Thus, the first path is in an elongated horseshoe pattern which passes by the coolant gas vent 742. However, the second path does not pass by the coolant gas vent 742, and thus any air in the coolant following the second path is not removed by the coolant gas vent. Furthermore, whereas the present claims align the air-releasing passage with the coolant discharge passage, Guthrie does not. As a result, any air which is present in the second path described above is forced, by the flow of the coolant, to the inside bottom corner of the coolant flow field. This is the opposite corner from the coolant gas vent 742; thus, in Guthrie much of the air in the coolant flow field becomes trapped as far away as possible from the coolant gas vent 742. That is, in Guthrie the flow of the coolant encourages the air away from the vent, preventing a reliable discharge of trapped air.

Therefore, instead of ameliorating the problem of trapped air in the coolant flow field, Guthrie in fact makes the problem worse by arranging the gas vent in a location such that the flow of the coolant directs the trapped air away from the vent. This fact evidences that Guthrie was not even aware of the problem solved by the present invention, and the Examiner has not cited any other references which recognize this problem.

In a similar situation in *In the Matter of the Application of Kosei Nomiya, Toshihiko Kohisa and Isao Matsumura* (509 F.2d 566 (C.C.P.A. 1975)), the Court addressed an invention directed to a type of transistor known as an insulated-gate-type –filed-effect transistor ("IGFET"). The applicants indicated that the claimed invention solved a problem of parasitic transistor action that caused a signal stored in the memory element of the transistor to discharge. *id* at 568. The applicants argued that the problem was not known in the prior art, and the Court emphasized that "a patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. *id* at 571. The Court stated that "if, as appellants claim, there is no evidence of record that a person of ordinary skill in the art at the time of appellants' invention would have expected the problem in the IGFET to exist at all, <u>it is not proper to conclude that the invention which solves this problem … would have been obvious to that hypothetical person of ordinary skill in the art</u>." *id* at 572, emphasis added.

Accordingly, contrary to the Examiner's suggestion, the presently claimed configuration specifically addresses a number of known problems. Not only does Guthrie fail to recognize these problems, but Guthrie's chosen configuration <u>compounds</u> the problems by trapping air in the coolant flow field as far away as possible from the vent. Accordingly, it is not proper to conclude that the claimed configuration would have been obvious to one of ordinary skill in the art.

2. <u>The Claimed Configuration is not a Mere Matter of Design Choice</u>

The Examiner argues, at pages 4-5 of the Office Action, that although Guthrie's fuel cell includes components in a different configuration from the present claims, it would have been obvious to modify Guthrie to arrive at the presently claimed configuration as a mere matter of design choice. However, the Examiner does not cite any motivation for why one of ordinary skill would make the proposed modifications, and does not provide one himself. Appellants respectfully submit that such a motivation could not exist given the teachings of the Guthrie reference, because any modification that would give rise to the configuration recited in the present claims would impermissibly render Guthrie unsuitable for Guthrie's explicitly stated purpose.

Furthermore, the Examiner relies on three cases to support his “design choice” argument, yet the cases cited by the Examiner are readily distinguishable from the present facts. In fact, the weight of the case law supports <u>the opposite</u> conclusion: that the design choice rationale is <u>inapplicable</u> to the present situation.

Each of these points is discussed in detail below.

a. <u>The Examiner Provides no Suggestion or Motivation for making the Proposed Modifications</u>

The Examiner argues, at pages 4-5 of the Office Action, that although Guthrie's fuel cell includes components in a different configuration from the present claims, it would have been obvious to modify Guthrie to arrive at the presently claimed configuration as a mere matter of design choice. The Examiner provides no rationale for why one of ordinary skill in the art would make these modifications.

Taken to its logical conclusion, the Examiner's argument would apply to nearly <u>every</u> invention, thus rendering all potential claims *de facto* obvious. Because every invention involves, to a certain extent, a rearrangement of existing components in a novel way, it could be argued that any invention is a design choice involving a mere rearrangement of parts. This is why the Supreme Court in *KSR* specifically cautioned <u>against</u> invoking a rationale such as “design choice” without providing a supporting rationale for making the proposed modifications:

> As is clear from cases such as *Adams*, a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art … It can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.
>
> (*KSR International Co. v. Teleflex Inc.*, 550 U.S. 398, 418-9 (2007))

In order to prevent the abuse of the “design choice” rationale, the Supreme Court has stated that it is necessary “to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, <u>this analysis should be made explicit</u>.” *id* at 418 (emphasis added). To further reinforce this point, the *KSR* Court quoted with approval from *In re Kahn*: “[R]ejections on obviousness grounds cannot be

sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006).

In this case, there is no apparent reason in the prior art to rearrange the parts as claimed in the present Application, and the Examiner does not provide one himself. Indeed, not only does Guthrie fail to recognize the solution described by the present Application, but the reference relied upon by the Examiner evidences that even the problem is not obvious to one of ordinary skill in the art. In fact, the reference arranges the components of the fuel cell in a way that makes the problem worse.

Appellants note that in *Ex parte Chicago Rawhide Manufacturing Company*, 223 USPQ 351 (Bd.App.1984), the claims of the then pending application were rejected as being obvious over a patent to Baney. The BPAI agreed with Appellant that the claims were not obvious in light of the cited reference by noting:

> As correctly urged by the appellant, and as apparently recognized by the Examiner, in order to meet the terms of the claims on appeal, the elements of the Baney device would have to be arranged in a manner different from that disclosed by Baney … The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of the appellant's specification, to make the necessary changes in the reference device.

223 USPQ at 356 (s*ee also In re Paul Chu, William Downs, John B. Doyle and Peter V. Smith*, 66 F.3d 292, 299 (Fed. Cir. 1995), finding that the claimed configuration of an SCR catalyst within a filter bag retainer would not have been "merely a matter of 'design choice'" in view of a reference teaching an SCR catalyst located outside of a filter, in part because "there is no teaching or suggestion in the prior art that would lead one of ordinary skill in the art to modify the [prior art] structure to place the SCR catalyst within a bag retainer as opposed to between two filter bags as disclosed in [the prior art]").

Accordingly, the courts have consistently required some rationale or motivation for making the proposed modifications in order to reject claims as a mere design choice. The rationale need not be explicitly stated in the reference, but some motivation or reason must be provided "without the benefit of the appellant's specification." *id.* No motivation or reason was provided in this case, and none is apparent from the references. Indeed, as described in more

detail in §VII.A.2.d below, a motivation to modify the Guthrie reference as the Examiner suggests could not exist because such a modification would impermissibly render Guthrie unsuitable for Guthrie's intended purpose.

Furthermore, the cases cited by the Examiner to support a finding of an "obvious design choice" are inapplicable to the present facts, as described below.

b. The Cases Cited by the Examiner are Inapplicable and Readily Distinguishable from the Present Facts

The Examiner cites three cases (*In re Launder*, 222 F.2d 371 (C.C.P.A. 1955), *Flour City Architectural Metals v. Alpana Aluminum Products, Inc.,* 454 F.2d 98 (8th Cir. 1972), and *National Connector Corporation* v. *Malco Manufacturing Company,* 392 F.2d 766 (8th Cir. 1968)) in support of his argument that the differences between the present application and Guthrie are merely a matter of design choice. However, the cited cases are readily distinguishable from the present facts, and are inapplicable to the present situation.

In *In re Launder*, the alleged invention involved the construction of a tooth for a digging implement, such as a power shovel, scoop, or trenching machine. 222 F.2d at 372. The applicants argued that the claims involved three novel features: first, the claims recited a cap including holes provided over the tooth, whereas the primary Crawford reference showed a wholly enclosed space or groove (*id* at 374-375); second, the claims recited a hole provided in the tooth through which a pin extended, the pin having two elongated sections with uniform cross sections (*id* at 375); third, the claims recited that the pin had one portion bearing against the tooth, and one portion bearing against the cap (*id* at 375).

With respect to the first feature (a cap having holes), the Court noted that even if the primary Crawford reference did not include the holes in the cap, the outstanding rejection was a §103 rejection in view of Crawford and Shaffer and Robertson. Shaffer and Robertson each included the hole structure recited in the claims, and used the holes in the same configuration for the same purpose. *id.* Therefore, the claimed cap with holes was in the prior art; it merely required the combination of two references to achieve a tooth equipped with a cap having holes. Similarly, with respect to the third feature, the Court noted that the Crawford reference included a single section which bears against both the tooth and cap; thus, Crawford inherently met this third limitation of the claim. *id.*

With respect to the second feature, the Court noted that the alleged difference appeared to be merely aesthetic. The Court noted that the shape of the pin (having two elongated sections with uniform cross sections) did not give rise to any particular function, and produced no new or unobvious result. *id*.

The applicants in *Launder* argued that the unobvious function achieved by their invention was that the cap "can move back on its tooth as there is wear between these parts," whereas in comparison "the cap of Crawford is driven as far back as it will go" (*id*). However, the court noted that the second feature did not give rise to this function. Indeed, nothing in the claim gave rise to the function which the applicants claimed was unique. Accordingly, the court was forced to conclude that "the claims fail to adequately define inventive features by proper limitations … even though the device would support patentable claims." *id* at 375-376, emphasis added.

Thus, of the three distinctions argued by the applicants, the first and third were present in the prior art in the exact configuration claimed, while the remaining distinction did not give rise to a nonobvious function. Although a nonobvious function did exist, the claim failed to recite the structure which gave rise to it.

In contrast, in the present Application the Examiner recognizes that the claimed configuration is not present in the cited references, giving rise to clear differences between the application and the prior art (as opposed to the first and third features of *Launder*). The differences, such as the relative locations of the air-releasing passage and the coolant inlet and outlet passages, give rise to a clear structural distinction (as opposed to the second feature of *Launder*) which produces the nonobvious result of efficiently removing a greater amount of air from the coolant field due to the motion of the coolant. This advantage is a direct result of the claimed structure, which was not the case in *Launder*.

The Examiner further cites *Flour City* and *National Connector*. In *Flour City* and *National Connector*, both 8th Circuit cases, the Court noted that all of the elements could be found in the prior art in the configuration recited in the claims, which is different from the present case where the prior art provides no guidance that would lead one of ordinary skill to the claimed invention.

In *Flour City*, the invention involved an insulated frame for windows or doors. 454 F.2d at 98. The applicant argued that the novel feature was the interlocking and overlapping frame members, which would not separate in the event that the vinyl insulator were to be destroyed by fire. *id* at 102. The Court noted that numerous patents described similar frames. Indeed, the Court stated that "in three ... prior art examples, the inner and outer metal frame members overlapped, with the insulation sandwiched between them in a manner substantially similar to the drawings of the Alpana patent." *id* at 107. The Court argued that the applicant had merely employed "old elements" in a way that did not change their function (*id* at 107-108); the only differences were changes in the size and shape of the flanges and lips, which merely amounted to "drafting details." *id*. Such changes would not, the Court reasoned, sustain patentability "in the absence of any new or unobvious result." *id* at 108.

The difference between the present case and *Flour City* is that, in the present case, the configuration recited in the claims give rise to a different function than Guthrie. The present application is able to remove <u>more air</u> from the coolant passage <u>more efficiently</u> than Guthrie because the claimed configuration leverages the flow of the coolant to encourage air <u>towards</u> the air-releasing passage, whereas Guthrie's coolant flow encourages air <u>away</u> from the air-releasing passage.

In *National Connector*, the applicant argued that the novelty of the patent lay in the fact that "it incorporates a flat or rectangular pin larger than the 'aperture of the sleeve.'" 392 F.2d at 768. However, the Court noted that "the prior art shows round terminals in round sleeves in round holes." *id*. The Court also noted that "rectangular terminals are not novel in the electronic field," and that there was "nothing novel or unique in changing a round pin to a flat one." *id* at 770.

Thus, *National Connector* stands for the proposition that switching one well-known component for another does not give rise to a patentable distinction. In contrast, the present claims recite a configuration which is not disclosed or suggested by the prior art. It is difficult to determine how *National Connector* is applicable to the present case, as the Examiner does not allege that the present case involves the substitution of one element for another. Indeed, the present application recites a configuration for a fuel cell which gives rise to a <u>different structure</u> than the prior art, and performs a <u>different function</u> in a <u>more efficient way</u> than the Guthrie reference.

In view of the above, none of the cases cited by the Examiner are applicable in this case. In contrast, other cases which are on-point establish that the "design choice" rationale is inapplicable where, as here, the proposed modification would require the components of the prior art reference to interact with each other in a different way or would require substantial reconstruction of the device.

c. The Weight of the Case Law Supports the Conclusion that the Design Choice Rationale is not Applicable to the Current Rejections

As noted above, one problem with the Guthrie reference is that the flow of the coolant encourages any air trapped in the coolant flow field away from the gas vent 742. Modifying the reference to meet the claim requirements would require that the coolant inlet manifold and coolant outlet manifold interact, through the coolant flow field, in a substantially different manner. In order to meet the claim requirements, Guthrie's coolant supply manifold would need to supply coolant to the outlet manifold in a different way, using a different coolant flow field pattern. For example, the coolant flow field could not be oriented in the elongated horseshoe pattern depicted in Guthrie's Figure 11, since the horseshoe pattern necessarily delivers coolant back to the same side of the fuel cell as the coolant originated from, whereas the present claims supply and discharge the coolant from opposite sides of the separator.

As the Court noted in *Ex Parte Chicago Rawhide Manufacturing Company*, 223 U.S.P.Q. (BNA) 351, claimed subject matter is not obvious under §103 where the elements of the reference, if rearranged, "would be required to coact differently from the way they coact in the arrangement disclosed by the reference." In the present case, the elements of Guthrie's coolant flow path, including the coolant inlet manifold, the coolant outlet manifold, the coolant flow field, and the coolant gas vent would need to be substantially rearranged and would need to coact in a different way, according to a different pattern, in order to meet the requirements of claim 1.

Furthermore, in order to meet the requirements of the claim, nearly every component of Guthrie would need to be moved to a different location (without, as described above, any stated rationale for doing so). However, it has been held that where a "substantial reconstruction and redesign" of the components of the cited reference would be required, the modification would not have been obvious.

For example, in *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), the claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. The court reversed the rejection holding the "suggested combination of references would require <u>a substantial reconstruction and redesign of the elements shown in [the primary reference]</u>" (as well as a change in the principle of operation of the reference). 270 F.2d at 813, 123 USPQ at 352; emphasis added.

In the present situation (taking the right-most separator of Figure 11 of Guthrie as an example), Guthrie's <u>coolant inlet 740</u> would need to be relocated from the right edge of the bottom side of the separator to the middle of one of the left side. Similarly, the <u>coolant outlet 744</u> would need to be moved from the left edge of the bottom side of the separator to the middle of the right side. This would be required to make the structure meet the claim requirement that *said coolant supply passage is provided at a middle position of one vertical end of said separator, and said coolant discharge passage is provided at a middle position of the other vertical end of said separator*.

Once the coolant inlet and outlet are moved to new positions, it would be necessary to reconstruct the coolant flow field in order to allow coolant to flow in the new direction (left-to-right instead of bottom-to-top) and to route the coolant from the new inlet position to the new outlet position (at the center of the separator, rather than a lower corner). This would require an entirely new coolant flow field shape.

Furthermore, the coolant inlet and outlet are currently provided below the flow field, and thus lie in the same plane as the coolant flow field. Moving the inlet and the outlet to the sides, as would be required by the claim, would move the inlet and outlet out of this plane to a space <u>beside</u> the flow field. Thus, in order to align the gas vent with the coolant outlet, as required by claim 1, the <u>gas vent 742</u> would also have to be moved (to the right in Figure 11, into the space that is presently taken up by the oxidant inlet manifold 710 and the empty space lying outside the fuel cell structure).

Of course, moving the coolant inlet 740 and the coolant outlet 744 in this manner would cause the inlet to be moved into the space currently occupied by the oxidant flow manifold 706,

and the outlet to be moved into the space currently occupied by the oxidant inlet manifold 710. The coolant inlet and outlet are holes in the separator, which pass through the separator in the stacking direction (i.e., perpendicular to the plane of the separator). The oxidant manifolds 706, 710, on the other hand, exist in the plane of the separator; thus, if the coolant inlet and outlet were simply moved to the new configuration without additional changes, the coolant would flow freely into the oxidant gas flow path instead of the coolant flow path. Accordingly, Guthrie's oxidant manifold system would also have to be reconfigured to accommodate at least two new holes passing through the system. Not only would this require a substantial reconstruction of Guthrie's fuel cell (without any stated motivation for doing so), but would impair the functionality of the shared oxidant manifold system (as there would now be obstacles in the oxidant flow path owing to the coolant inlet and outlet now present in the oxidant flow path).

Indeed, the modifications proposed by the Examiner would impermissibly require substantial reconstruction of the Guthrie fuel cell. Moreover, one of ordinary skill in the art would not be motivated to make these modifications, because the proposed modifications would impermissibly render Guthrie unsuitable for Guthrie's stated purpose.

d. <u>The Examiner's Proposed Modifications would Impermissibly Render Guthrie Unsuitable for Guthrie's Stated Purpose</u>

Guthrie notes that a number of different configurations for a fuel cell can be used. <u>However</u>, the one common feature that Guthrie requires from each embodiment is that a common manifold be used between a pair of fuel cell stacks for sharing either the oxidant gas or the fuel gas between the fuel cells (Guthrie at Abstract and column 13, lines 56-65, stating "it is a major aspect of the present invention … to provide a common, integrated manifold system which is applicable to a fuel cell power plant").

The modifications proposed by the Examiner would undermine the operation of Guthrie's common manifold in such a way that would render Guthrie unsuitable for Guthrie's intended purpose. If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *see* Manual of Patent Examining Procedure at §2143.01.V; *see also In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) (A prior art reference taught a liquid strainer for removing dirt and water from gasoline and other light oils wherein the inlet and outlet were at the top of the device, and wherein a pet-cock (stopcock) was located at the

bottom of the device for periodically removing the collected dirt and water. The reference further taught that the separation is assisted by gravity. The Board concluded the claims were *prima facie* obvious, reasoning that it would have been obvious to turn the reference device upside down. The court reversed, finding that if the prior art device was turned upside down it would be inoperable for its intended purpose because the gasoline to be filtered would be trapped at the top, the water and heavier oils sought to be separated would flow out of the outlet instead of the purified gasoline, and the screen would become clogged.).

Modifying Guthrie's structure as suggested by the Examiner would render Guthrie unsuitable for the intended purpose of providing a common manifold which provides a uniform flow of reactant gases across the fuel cells. Such a modification would require that the coolant passages be provided in the location currently occupied by the common reactant gas manifold (which, as Guthrie notes, can be used for either the oxidant gas or the fuel gas; *see* Guthrie at column 3, lines 27-48). Thus, the proposed modification would require that the manifolds be provided with passages for accommodating the coolant inlets and outlets.

The problem with providing such these passages in the area occupied by the common manifolds is that these passages would inherently block the flow of reactant gas through the manifolds. In operation, it is important that reactant gases be supplied uniformly to the entire surface of the electrode assembly, or else "dead spots" where no electricity is generated will develop and weaken the electrodes. Indeed, Guthrie specifically states that an important feature of the common manifold is that, in comparison to the prior art, it "more uniformly delivers the necessary reactants to the fuel cell stacks comprising the fuel cell power plant. This uniform distribution of reactants increases the operational stability of [the] fuel cell power plant by substantially reducing current and temperature variations within the fuel cell stack" (Guthrie at column 14, lines 1-9).

Arranging the coolant supply and discharge passages on the outer vertical sides of the separator, as described in the present claims, would place obstacles in this common path through which the flow of reactant gases would be blocked. For example, consider what would occur if a coolant supply passage were placed in the middle region of the central oxidant manifold 706 of Guthrie, as would be required by the present claims. The oxidant gas passing along the central manifold 706 would pass freely from the right fuel cell stack to the left fuel cell stack at the top and bottom of the manifold, but would be blocked by the coolant passage in the middle of the

manifold. Thus, the area immediately adjacent to the proposed coolant inlet on the left-side separator would not receive the oxidant, as the coolant supply passage would cast a "shadow" on this portion of the separator. Accordingly, a dead zone would occur in the shadow where electricity could not be generated because no oxidant was being supplied.

Thus, modifying the Guthrie fuel cell to make Guthrie fit the requirements of the present claims would undermine the need to uniformly supply the reactant gases through the central, integrated manifold, and would therefore impermissibly render Guthrie unsuitable for Guthrie's intended purpose.

e. Conclusion

In summary, Gyoten is entirely silent with respect to a coolant supply passage, a coolant discharge passage, a coolant flow field, and an air-releasing passage. While Guthrie does discuss several of these components, the present claims require a particular alignment of the components in order to achieve two functions: removing air that moves in a bottom-to-top manner, and removing air that moves in a supply-passage-to-discharge-passage manner. Even if Guthrie accomplishes the first function, Guthrie fails to achieve the second function. Further, Guthrie evidences that one of ordinary skill in the art would not even recognize that the second function may be important, because Guthrie arranges the components of the fuel cell in such a way that the second function is actively undermined. The Examiner recognizes that Guthrie's components are not arranged to achieve this second function, but argues (without providing any rationale) that it would have been obvious to rearrange Guthrie's components into the claimed configuration. However, for the reasons discussed above, the Examiner's proposed modifications would not have been obvious to one of ordinary skill in the art in view of Guthrie and Gyoten.

Therefore, even if Guthrie and Gyoten are combined, the combination still fails to disclose or suggest the configuration recited in claim 1. Claims 5 and 6 depend from claim 1, and is therefore allowable for at least the same reasons as claim 1.

B. *Claim 2*

Claim 2 depends from claim 1, and is therefore allowable for at least for the same reasons as claim 1. Nonetheless, claim 2 recites further patentable subject matter, and accordingly Appellants argue separately for the patentability of claim 2.

Dependent claim 2 recites that *at least the top of said coolant flow field is inclined upwardly toward said air-releasing passage*. As recited in claim 2, the uppermost portion of the coolant flow field is inclined upwardly toward the air-releasing passage. The air in the coolant flow field moves smoothly toward the air-releasing passage due to the inclination at the top of the coolant flow field. Thus, the air is discharged from the coolant flow field into the air-releasing passage efficiently.

The Examiner does not consider this feature in the Office Action. Instead, the Examiner simply states "with respect to claims 1 and 2 …" and then provides a summary of the Guthrie reference. The particular feature of the top of the coolant flow field being <u>inclined</u> toward the air releasing passage is not addressed. Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been established with respect to claim 2.

Furthermore, Appellants respectfully submit that one of ordinary skill in the art would not modify Guthrie (even in view of Gyoten) in order to incline the top of the coolant flow field towards the air-releasing passage for at least three reasons.

First, there is no rationale in Guthrie or Gyoten, or in any notice taken by the Examiner, for making such a change. To modify the reference in such a way would merely be using the Appellants' claims as a template without any rationale or motivation in the art.

Second, as noted above the flow of coolant in Guthrie carries air <u>away</u> from the coolant releasing passage, towards the bottom inside corner of the separator (the opposite corner from the gas vent). Inclining the top of the coolant flow field toward the vent would thus serve no purpose, since the coolant is actively pushing the air <u>away</u> from the vent.

Third, in contrast to (for example) the embodiment shown at Figure 11 of the present application, Guthrie disposes the fuel inlet manifold 730 and the fuel outlet manifold 732 directly above the coolant flow field. These manifolds are holes passing through the separator. Inclining the top of the coolant flow field towards the gas vent would therefore cause the coolant flow field to move into space currently taken up by the fuel outlet manifold. In addition to the

coolant flow field itself, the separator is typically provided with a seal around the coolant flow field, so that the coolant cannot escape the flow field and leak into other parts of the fuel cell. Accordingly, inclining the top of the coolant flow field in the configuration described by Guthrie would reduce the size of the fuel outlet manifold, which would reduce the amount of fuel gas that can be delivered to the electrode assembly because both the coolant flow field and the seal would take up space that was otherwise available for the outlet manifold 732.

In contrast, Figure 11 of the present application shows a configuration in which the top of the separator plate consists of empty space (the fuel gas supply and discharge passages being located on the vertical ends of the separator). Thus, the top of the coolant flow field can be inclined without impacting on the fuel gas supply and discharge passages. Such a configuration is not possible in Guthrie: as discussed above, the manifolds cannot be moved to the sides of the separators without undermining Guthrie's stated purpose, which is to provide a common manifold that utilizes that space. Either some of the passages need to be provided on the top of the coolant flow field (in which case inclining the top of the field interferes with these passages), or else all the passages (aside from the common manifold) need to be provided on the bottom of the separator. This would leave the top of the separator free, but would mean that only half as much fuel and coolant can be delivered to the separator, resulting in reduced functionality of the fuel cell.

In summary, Gyoten does not describe coolant or a coolant flow field at all, and hence does not disclose or suggest inclining the top of the coolant flow field. Guthrie also does not disclose or suggest inclining the top of the coolant flow field, and given the configuration that Guthrie relies upon to achieve his stated purpose, one of ordinary skill in the art would not modify Guthrie to incline the top of the coolant flow field. Furthermore, there is no rationale for doing so in the prior art.

Accordingly, even if Gyoten is combined with Guthrie, the combination still fails to disclose or suggest the features of claim 2.

VIII. APPENDIX OF CLAIMS

A copy of the claims involved in the present appeal is set forth in Appendix A.

IX. CONCLUSION and PRAYER FOR RELIEF

In view of the above arguments, Appellant urges the Examiner and the Board to reconsider and withdraw the current §103(a) rejections and to pass the claims to allowance.

Appellant believes that the pending application is in condition for allowance. If additional fees are due, please charge our Deposit Account No. 12-0080, under Order No. TOW-051RCE3 from with the undersigned is authorized to draw.

Dated: November 17 , 2010

Respectfully submitted,

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/721,616.

1. A fuel cell comprising:

an electrolyte electrode assembly including a pair of electrodes and an electrolyte interposed between said electrodes;

separators for sandwiching said electrolyte electrode assembly,

wherein the separator is in an upright position and a width of the separator is greater than a height of the separator,

wherein a reactant gas supply passage, a reactant gas discharge passage, a coolant supply passage, and a coolant discharge passage extend through said fuel cell in a stacking direction of said fuel cell;

a coolant flow field is formed along a surface of said separator and extends along a portion of said surface that corresponds to a power generation surface of said electrolyte electrode assembly, wherein said coolant flow field connects said coolant supply passage to said coolant discharge passage;

said coolant supply passage is provided at a middle position of one vertical end of said separator, and said coolant discharge passage is provided at a middle position of the other vertical end of said separator; and

an air-releasing passage connected to said coolant flow field for releasing air from said coolant flow field is formed at an upper position of the other vertical end of said separator such that at least part of said air-releasing passage is positioned above a top of said coolant flow field,

wherein said coolant flow field is in fluid communication with said coolant supply passage, said coolant discharge passage and said air-releasing passage on a single surface of said separator,

wherein said separator includes first and second metal plates which are stacked together, and said coolant flow field is formed between said first and second metal plates,

wherein said coolant flow field is in contact with said first and second metal plates,

wherein said air-releasing passage is positioned above said coolant discharge passage at the other vertical end of the separator,

wherein the air-releasing passage is aligned with the coolant discharge passage on the same side of the separator as the coolant discharge passage is positioned.

2. A fuel cell according to claim 1, wherein at least the top of said coolant flow field is inclined upwardly toward said air-releasing passage.

3-4. (Canceled)

5. A fuel cell according to claim 1, wherein said first metal plate has an oxygen-containing gas flow field in a serpentine pattern on a surface opposite to said coolant flow field, and said second metal plate has a fuel gas flow field in a serpentine pattern on a surface opposite to said coolant flow field.

6. A fuel cell according to claim 1, wherein said reactant gas supply passage comprises an oxygen-containing gas supply passage and a fuel gas supply passage, and said reactant gas discharge passage comprises an oxygen-containing gas discharge passage and a fuel gas discharge passage; and

said oxygen-containing gas supply passage and said fuel gas supply passage are provided at lower positions of opposite vertical ends of said separator, and said oxygen-containing gas discharge passage and said fuel gas discharge passage are provided at upper positions of opposite vertical ends of said separator.

APPENDIX B

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the Examiner is being submitted.

APPENDIX C

No related proceedings are referenced in Section II above, hence copies of decisions in any related proceedings are not provided.